Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) An apparatus for positioning a sensing head relative to a workpiece, the apparatus comprising:

a control unit operative to provide a plurality of control signals to iteratively control positioning of the sensing head relative to the workpiece;

a plurality of air injectors disposed and fixedly connected on ~~the~~a periphery of the sensing head, each of the air injectors ~~receiving the control signals and ejecting~~capable of being independently controlled to eject a gas between the sensing head and the workpiece to create an air bearing and affect positioning of the sensing head relative to the workpiece in response to at least one of the control signals; and

a plurality of sensors capable of providing a plurality of feedback signals to the control unit, the feedback signals containing information relating to positioning of ~~the~~an optical imaging sensing head relative to the workpiece.

2. (Currently Amended) ~~The apparatus of claim 1,~~An apparatus for positioning a sensing head relative to a workpiece, the apparatus comprising:

a control unit operative to provide a plurality of control signals to iteratively control positioning of the sensing head relative to the workpiece;

a plurality of air injectors disposed and fixedly connected on a periphery of the sensing head, the air injectors capable of ejecting a gas between the sensing head and the workpiece to create an air bearing and affect positioning of the sensing head relative to the workpiece in response to at least one of the control signals;

a plurality of sensors capable of providing a plurality of feedback signals to the control unit, the feedback signals containing information relating to positioning of an optical imaging sensing head relative to the workpiece; and

wherein the control unit is further operative to map readings received from the sensors from a sensor-space representation to a virtual-sensor-space representation before

forming an output-to-movement relationship such that an inverse of an output-to-movement relationship is more likely to be obtainable.

3. (Original) The apparatus of claim 1 further comprising:

a support member connected with the sensing head, the support member substantially restricting movement of the sensing head to (a) translational movement along a z-axis, (b) rotational movement about an x-axis normal to the z-axis, and (c) rotational movement about a y-axis normal to the z-axis.

4. (Currently Amended) An apparatus for positioning a sensing head relative to a workpiece, the apparatus comprising:

a plurality of first air injectors fixedly connected with the sensing head;

a plurality of second air injectors fixedly connected with the sensing head;

a plurality of sensors providing a plurality of feedback signals ~~to the control unit~~, the feedback signals containing information relating to positioning of the sensing head relative to the workpiece; and

a control unit receiving the plurality of feedback signals from the sensors and controlling the first and second air injectors, the control unit capable of bringing positioning of the sensing head relative to the workpiece within a desired range by iteratively adjusting the first air injectors, the control unit being capable of adding an additional separation distance to positioning of the sensing head relative to the workpiece by operating the second air injectors.

5. (Original) An apparatus for positioning a sensing head relative to a workpiece, the apparatus comprising:

a plurality of sensors operative to detect a reading of positioning of the sensing head relative to the workpiece;

a plurality of air injectors fixedly connected with the sensing head, each of the air injectors capable of ejecting a gas with a variably controllable output level between the sensing head and the workpiece in order to affect positioning of the sensing head relative to the workpiece; and

a control unit operative to receive the reading from the sensors and to control the air injectors, the control unit being capable of locating the sensing head relative to the workpiece within a desired range, said locating comprising:

(a) varying the output level of each air injector by a small amount and noting a resulting change in the reading received from the sensors in order to form an output-to-movement relationship;

(b) applying an inverse of the output-to-movement relationship to the reading received from the sensors in order to calculate a plurality of output adjustments;

(c) adjusting the output levels of the air injectors by the output adjustments; and

(d) repeating (a) through (c) until positioning of the sensing head relative to the workpiece is within the desired range.

6. (Original) The apparatus of claim 5, wherein the control unit is further operative to map the reading received from the sensors from a sensor-space representation to a virtual-sensor-space representation before forming the output-to-movement relationship such that the inverse of the output-to-movement relationship is more likely to be obtainable.

7. (Original) The apparatus of claim 5 further comprising:

a support member connected with the sensing head, the support member substantially restricting movement of the sensing head to (a) translational movement along a z-axis, (b) rotational movement about an x-axis normal to the z-axis, and (c) rotational movement about a y-axis normal to the z-axis

8. (Original) The apparatus of claim 7, wherein the support member is a cantilever spring.

9. (Original) The apparatus of claim 5, wherein the gas that is ejected between the sensing head and the workpiece is air.

10. (Original) The apparatus of claim 5, wherein the air injectors are fixedly connected with the sensing head at asymmetrical locations juxtaposed to the sensing head.

11. (Original) The apparatus of claim 5, wherein the air injectors are fixedly connected with the sensing head at locations juxtaposed to a perimeter portion of the sensing head.

12. (Original) The apparatus of claim 5, further comprising a plurality of additional air injectors fixedly connected with the sensing head, the additional air injectors capable of ejecting gas between the sensing head and the workpiece in order to add an additional separation distance to positioning of the sensing head relative to the workpiece.

13. (Original) The apparatus of claim 5, wherein a filler material is disposed as a seal between the sensing head and the air injectors to eliminate air leakage paths between the sensing head and the air injectors.

14. (Currently Amended) A method for positioning a sensing head relative to a workpiece, the method comprising the steps of:

detecting, using a plurality of sensors, a reading of positioning of the sensing head relative to the workpiece;

ejecting from a plurality of air injectors fixedly connected with the sensing head a gas between the sensing head and the workpiece in order to affect positioning of the sensing head relative to the workpiece; and

locating the sensing head relative to the workpiece within a desired range, said locating comprising:

(a) varying ~~the~~an output level of each air injector by a small amount and noting a resulting change in the reading received from the sensors in order to form an output-to-movement relationship;

(b) applying an inverse of the output-to-movement relationship to the reading received from the sensors in order to calculate a plurality of output adjustments;

(c) adjusting the output levels of the air injectors by the output adjustments; and

(d) repeating (a) through (c) until positioning of the sensing head relative to the workpiece is within the desired range.

15. (Original) The method of claim 14, further comprising the step of mapping the reading received from the sensors from a sensor-space representation to a virtual-sensor-space representation before forming the output-to-movement relationship such that the inverse of the output-to-movement relationship is more likely to be obtainable.

16. (Original) The method of claim 14, further comprising the step of substantially restricting movement of the sensing head to (a) translational movement along a z-axis, (b) rotational movement about an x-axis normal to the z-axis, and (c) rotational movement about a y-axis normal to the z-axis

17. (Original) The method of claim 14, wherein the gas that is ejected between the sensing head and the workpiece is air.

18. (Original) The method of claim 14, wherein the air injectors are fixedly connected with the sensing head at asymmetrical locations juxtaposed to the sensing head.

19. (Original) The method of claim 14, wherein the air injectors are fixedly connected with the sensing head at locations juxtaposed to a perimeter portion of the sensing head.

20. (Original) The method of claim 14, further comprising the step of ejecting from a plurality of additional air injectors fixedly connected with the sensing head gas between the sensing head and the workpiece in order to add an additional separation distance to positioning of the sensing head relative to the workpiece.

21. (Currently Amended) A system for positioning a sensing head relative to a workpiece, the system comprising:

means for detecting a reading of positioning of the sensing head relative to the workpiece using a plurality of sensors;

means for ejecting from a plurality of air injectors fixedly connected with the sensing head a gas between the sensing head and the workpiece in order to affect positioning of the sensing head relative to the workpiece; and

means for locating the sensing head relative to the workpiece within a desired range, said locating comprising:

(a) varying ~~the~~an output level of each air injector by a small amount and noting a resulting change in the reading received from the sensors in order to form an output-to-movement relationship;

(b) applying an inverse of the output-to-movement relationship to the reading received from the sensors in order to calculate a plurality of output adjustments;

(c) adjusting the output levels of the air injectors by the output adjustments; and

(d) repeating (a) through (c) until positioning of the sensing head relative to the workpiece is within the desired range.

22. (Original) The system of claim 21, further comprising means for mapping readings received from the sensors from a sensor-space representation to a virtual-sensor-space representation before forming the output-to-movement relationship such that the inverse of the output-to-movement relationship is more likely to be obtainable.

23. (Original) The system of claim 21, further comprising means for substantially restricting movement of the sensing head to (a) translational movement along a z-axis, (b) rotational movement about an x-axis normal to the z-axis, and (c) rotational movement about a y-axis normal to the z-axis

24. (Original) The system of claim 21, wherein the gas that is ejected between the sensing head and the workpiece is air.

25. (Original) The system of claim 21, wherein the air injectors are fixedly connected with the sensing head at asymmetrical locations juxtaposed to the sensing head.

26. (Original) The system of claim 21, wherein the air injectors are fixedly connected with the sensing head at locations juxtaposed to a perimeter portion of the sensing head.

27. (Original) The system of claim 21, further comprising:

means for ejecting from a plurality of additional air injectors fixedly connected with the sensing head gas between the sensing head and the workpiece in order to add an additional separation distance to positioning of the sensing head relative to the workpiece.